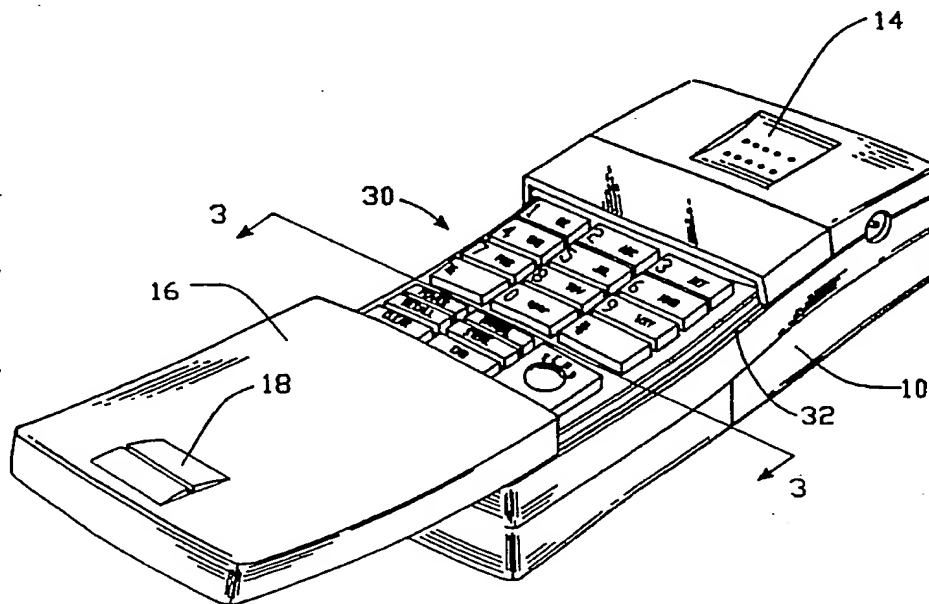


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>H04M 1/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 92/09163</b>  <b>(43) International Publication Date:</b> 29 May 1992 (29.05.92)
<b>(21) International Application Number:</b> PCT/US91/08518 <b>(22) International Filing Date:</b> 14 November 1991 (14.11.91) <b>(30) Priority data:</b> 614,284 16 November 1990 (16.11.90) US <b>(71) Applicant:</b> UNIVERSAL CELLULAR, INC. [US/US]; 3365 East Miraloma Boulevard, Anaheim, CA 92806 (US). <b>(72) Inventors:</b> WOHL, James, P. ; 1436 Benedict Canyon Drive, Beverly Hills, CA 90210 (US). NAUGLER, W., Edward, Jr. ; 4432 Hazlenut Avenue, Seal Beach, CA 90740 (US). HENDERSHOT, James ; 5129 Avenida de Amor, Yorba Linda, CA 92686 (US). LLOYD, Graham, P. ; 3019 Ingersoll Place, Fremont, CA 94538 (US). GRIFFIN, Michael ; 13812 Barney Drive, Garden Grove, CA 92643 (US). CHU, Robin ; 38 Melrose Avenue, San Francisco, CA 94131 (US).		<b>(74) Agents:</b> GALLIANI, William, S. et al.; Flehr, Hohbach, Test, Albritton & Herbert, 4 Embarcadero Center, Suite 3400, San Francisco, CA 94111-4187 (US).  <b>(81) Designated States:</b> AT (European patent), AU, BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), GR (European patent), HU, IT (European patent), JP, KR, LU (European patent), NL (European patent), NO, SE (European patent), SU <sup>+</sup> .  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i>

**(54) Title:** PORTABLE TELEPHONE HOUSING**(57) Abstract**

A portable telephone housing with a sliding member (16) which is connected by an engaging member (34) to a track (32) formed within the body (10) of the portable telephone. The sliding member (16) moves along the track away from the body (10), exposing a keypad (30). The keypad (30) includes a light sensor (54) which is coupled to a control element (58) which variably illuminates the keypad (30) contingent upon the ambient light. The sliding member (16) encases an antenna (70) which works in conjunction with antenna (72) within the body of the portable telephone.

# **+ DESIGNATIONS OF "SU"**

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

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- 1 -

## PORTABLE TELEPHONE HOUSING

Technical Field

This invention relates to a portable telephone housing. More particularly, it relates to a portable telephone housing with a sliding member which encases an antenna and extends from the housing to expose a luminescent keypad.

Background Art

Portable telephones are well known in the art. Some portable telephones are used in a home, communicating with a base station which is connected to a telephone line; some portable telephones are more mobile in nature, for instance car phones, these phones utilize cellular technology. Regardless of the type of portable telephone, certain problems are common to all of these telephones.

One problem relates to the keypad on such telephones. Given the mobile nature of the telephones, the keypad on a telephone is likely to encounter debris or be physically damaged. This may result in degraded performance of the telephone. Another problem with such telephones relates to the difficulty of reading the keypad when the telephone is in a dark environment. While a lighted keypad can readily be provided, such a keypad consumes excessive energy. Since the energy source on a portable telephone is limited, it is desirable to conserve the energy source.

A final problem relates to the antenna of portable telephones. Typically, the antenna must be pulled out and pushed into the telephone. Thus, separate motion is required to utilize the antenna. This pushing and pulling of the antenna often damages the antenna. When the antenna is in its extended position it is vulnerable to

-2-

physical damage. Similarly, when the antenna is extended it may injure individuals near the telephone, for instance by poking them in the eye.

5       **Objects and Summary of the Invention**

It is a general object of the present invention to provide an improved housing for a portable telephone.

It is a more particular object of the present invention to provide a portable telephone housing which  
10       protects the keypad.

It is another object of the present invention to provide a portable telephone which includes a luminescent keypad which consumes a minimal amount of energy.

It is still another object of the present invention  
15       to provide a portable telephone housing which serves to protect the antenna and individuals from injury.

These and other objects are achieved by a portable telephone housing with a sliding member which is connected by an engaging member to a track formed within the body  
20       of the portable telephone. The sliding member moves along the track away from the body, exposing a keypad. The keypad includes a light sensor which is coupled to a control element which variably illuminates the keypad contingent upon the ambient light. The sliding member  
25       encases an antenna which works in conjunction with an antenna within the body of the portable telephone.

Brief Description of Drawings

30       Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIGURE 1 is a perspective view of the housing, or body, of a portable telephone, in accordance with the  
35       present invention, including a sliding member which is in a contracted, or closed, position.

-3-

FIGURE 2 is a perspective view of the housing of a portable telephone, in accordance with the present invention, including a sliding member which is in an extended, or open, position.

5           Figure 3 is a cross-sectional exploded view, taken along the line 3-3 of Figure 2, of a track formed in the body of a portable telephone and the engaging member formed within the sliding member which interconnects to the track, in accordance with the present invention.

10           FIGURE 4 is a cross-section view of the energy conserving illuminated keypad in accordance with the present invention.

15           FIGURE 5 is a cross-sectional view of the antenna within the body and the antenna within the extended sliding member of the portable telephone of the present invention.

20           FIGURE 6 is a cross-sectional view of the antenna within the body and the antenna within the contracted sliding member of the portable telephone of the present invention.

#### Best Mode for Carrying out the Invention

Turning now to the drawings, wherein like components are designated by like reference numerals in the various figures, attention is initially directed to Figure 1. In the figure, a portable telephone 8 is depicted. The portable telephone 8 includes a body (or housing) 10. Preferably, the housing is formed of a dielectric material. On the front of the body 10 there is a display 12, utilized to display a phone number or other information, as is known in the art. The body 10 also includes an earpiece 14. The body 10 includes a sliding member (or slide) 16, also preferably formed of a dielectric material, in a closed position. The sliding member 16 includes a top region 16A and a bottom region 16B. A microphone 18 is positioned in the bottom region 16B.

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30  
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-4-

Figure 2 depicts the sliding member 16 in an open position, extending from the body 10. It can be appreciated that in a preferable embodiment bottom region 16B is curved so as to be closer to the mouth of an individual using the telephone 8. When the telephone 8 is in this open position, it can be seen that the body 10 includes a keypad (or keyboard) 30. Thus, in an open position the keypad may be utilized, while in the closed position it is shielded from physical damage, such as intrusion by debris or liquid.

On each side of the keypad there is a track 32. One embodiment of the track 32 is depicted in Figure 3. The track 32 includes an elongated protrusion 40 which runs along the longitudinal axis of the body 10. Adjacent to the elongated protrusion 40 is an elongated slot 42 which is formed within the body 10 and also runs along the longitudinal axis. Sliding member 16 includes engaging member 34 which is cooperatively aligned with track 32. One particular embodiment of engaging member 34 is depicted in Figure 3. An elongated aperture 44 runs along the longitudinal axis of the sliding member 16. Similarly, an elongated lip 46 runs along the longitudinal axis. It can be appreciated, then, that the elongated protrusion 40 of the body 10 is aligned with the elongated aperture 44 of the slide 16; analogously, the elongated slot 42 of the body 10 is aligned with the elongated lip 46 of the body 10. As a result, engaging member 34 allows sliding member 16 to move along the track 32 of body 10 from a contracted position, as shown in Figure 1 to an extended position as shown in Figure 2.

There is an additional feature associated with the movement of the slide 16 from its contracted position to its extended position. Preferably, this movement activates the telephone. One way of accomplishing this activation is to place a resistance element 47 within the slide 16. The resistance element 47 may be the microphone 18. The resistance element 47 may be coupled to a lead

-5-

48 which makes contact with a current source 49 when the slide 16 is in an extended position. A current sensor 50 may be used to sense current in resistance element 47. Once the current sensor 50 is triggered, the phone may be activated, as is known in the art. Thus, by moving the slide from its contracted position to its extended position, the telephone is activated.

Turning now to Figure 4, depicted therein is a cross-section view of the keypad 30. Preferably, the keypad is formed of an elastomeric rubber which conducts light. Positioned beneath the keypad 30 is a printed circuit board 51, preferably formed of a translucent material. Positioned beneath the board 51 is a luminescent panel 53. The panel 53 is activated in the following manner. A light sensitive diode 54 is positioned on the printed circuit board 51, beneath the translucent elastomeric keypad 30. The output from the diode 54 is fed by lead 56 to a control element 58. The control element 58 may be a microprocessor or other element known in the art. The control element 58, via lead 59, variably illuminates the panel 53. Preferably, the control element is configured such that when the sensor 54 generates a weak signal the panel 53 is highly illuminated. Similarly, when the sensor 52 generates a strong signal the panel 53 is not illuminated. Thus, through this apparatus, the keypad 30 is illuminated when the ambient light is low and lighting is necessary. On the other hand, when the ambient light is adequate, the keypad 30 need not be illuminated, thereby conserving energy.

Another aspect of the present invention is revealed in Figure 5. It is difficult to provide a suitable ground plane for the antenna of a small package, such as a portable telephone. As a result, antennas in portable telephones are usually pulled from within the body to a position which extends from the body. The problem with this solution is that an antenna which protrudes from the body of a portable telephone may be damaged and may cause

damage to an individual. In addition, when an antenna is in its retracted position within the body of the telephone, it is difficult to obtain a signal. To rectify this problem, an internal antenna is often employed. An RF switch is then required to switch between the two antennas. This extra hardware tends to make the telephone more cumbersome and expensive.

In accordance with the present invention, this problem has been solved. In Figure 5 a portable telephone body 10 is depicted in cross section while the slide 16 is in an extended position. A stripline antenna 70 is positioned within the slide 16. The antenna 70, in conjunction with the shielding of the case, modeled as line segment 72, forms a dipole antenna, with the stripline 70 being a quarter wavelength of the frequency for which the portable telephone is utilized. The stripline 70 is used as the radiating element, being fed from transmitter 74. The width of the stripline 70 is determined by creating an impedance match to the shielding.

Turning now to Figure 6, the configuration of the shielding of the case 72 and the antenna 70 is depicted when slide 16 is in a contracted position. In the contracted position, the shielding isolates the antenna, thus it is difficult for the antenna to receive signals.

This reception problem is solved by modeling the body 10 as a "J antenna." That is, the length of the case is more than one quarter of a wavelength. If the body is formed of a material with a dielectric constant of approximately 2, the dielectric loading of the body results in a body with effectively a half wavelength. To feed the shielding 72 as an antenna when the slide 16 is in the closed position, the antenna 72 is treated as a transformer. The transmitter 72 is fed at the base of the resultant J antenna. The exact location of the feed is selected in order to match the antenna to the shielding impedance, which is approximately 50 ohms.



-7-

Thus, it is apparent that there has been provided, in accordance with the invention, an improved portable telephone housing which fully satisfies the objects, aims, and advantages set forth above. While the invention has  
5 been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such  
10 alternatives, modifications, and variations as fall within the spirit and scope of the appended claims.

What is claimed:

1. A portable telephone comprising:
  - 5 a body, said body including a keypad and a curved track;
  - a curved sliding member, said curved sliding member including an engaging member interconnected to said track whereby said engaging member moves along said curved track allowing said curved sliding member to move from a first  
10 position covering said keypad to a second position extending from said body and thereby exposing said keypad.
2. The portable telephone of claim 1 wherein the bottom  
15 region of said curved sliding member is curved upward from said body whereby said bottom region is closer to the mouth of an individual using said telephone.
3. The portable telephone of claim 1 wherein said track  
20 includes an elongated protrusion and an elongated slot.
4. The portable telephone of claim 2 wherein said  
engaging member includes an elongated aperture and an elongated lip.
- 25 5. The portable telephone of claim 3 wherein said elongated protrusion is aligned with said elongated aperture and said elongated slot is aligned with said elongated lip.
- 30 6. A portable telephone comprising:
  - a body;
  - means for sensing electrical current and thereby activating said telephone;
  - a sliding member positionable (i) in a contracted  
35 position with said body, and (ii) in an open position extended from said body;

-9-

a microphone positioned in said sliding member whereby when said sliding member is moved from said contracted position to said open position current begins to flow within said microphone such that said sensing means activates said telephone.

7. A portable telephone comprising:  
a body;  
a keyboard positioned on said body;  
means for illuminating said keyboard;  
a light sensor positioned on said body;  
a control element positioned within said body and coupled to said sensor whereby said control element variably activates said means for illuminating said keyboard in response to an absence of ambient light as measured by said sensor.

8. The apparatus of claim 6 wherein said keyboard is formed of an elastomeric material.

9. The apparatus of claim 7 wherein said means includes a translucent printed circuit board positioned beneath said keyboard and a luminescent panel positioned beneath said printed circuit board.

10. The apparatus of claim 8 wherein said control element is a microprocessor which variably illuminates said luminescent panel.

11. A portable telephone comprising:  
a body including (1) a top end supporting an earpiece and internal shielding and (2) a bottom end supporting a microphone and an internal antenna, whereby said antenna and said shielding operate in conjunction to receive and transmit signals.

12. A portable telephone comprising:

a body with internal shielding, said body including a top end supporting an earpiece and a bottom end supporting a microphone; and

5 a member positioned on said body, supporting said microphone, positionable (i) in a contracted position within said body and (ii) in an open position extended from said body whereby said antenna and said shielding operate in conjunction to receive and transmit signals whether said member is in said contracted position or said  
10 open position.

13. The apparatus of claim 12 wherein said antenna and said shielding form a dipole antenna when said member is in said open position.  
15

14. The apparatus of claim 12 wherein said shielding and said antenna form a J antenna when said member is in said contracted position.

20 15. The apparatus of claim 12 wherein said member includes means for sliding along said body.

16. A portable telephone comprising:

- (A) a body, said body including  
25 (1) a keypad formed from an elastomeric material;  
(2) means for illuminating said keypad;  
(3) a light sensor positioned on said body;  
(4) a control element positioned within said  
30 body and coupled to said light sensor, said control element variably activating said illuminating means in response to an absence of ambient light as measured by said sensor;  
(5) a curved track;  
35 (6) internal shielding at the top end of said body; and

-11-

(B) a curved sliding member, said curved sliding member including an engaging member interconnected to said track and an internal antenna segment, said internal antenna segment operating in conjunction with said internal shield to receive and transmit signals, and said engaging member moving along said curved track allowing said curved sliding member to move from a first position covering said keypad to a second position extending from said body.

10

## AMENDED CLAIMS

[received by the International Bureau on 22 April 1992 (22.04.92);  
original claims 1-6 cancelled; new claims 1-3 added;  
other claims unchanged (1 page)]

1. A portable telephone comprising:
  - a body including a keypad and a track;
  - a sliding member positionable (i) in a contracted position within said body, and (ii) in an open position extended from said body, said sliding member moving from said contracted position to said open position along said track;
  - an energy source positioned within said body;
  - a resistance element positioned in said sliding member, said resistance element coming into electrical contact with said energy source when said sliding member is moved from said contracted position to said open position; and
  - means for sensing electrical current produced by said electrical contact between said energy source and said resistance element, said sensing means initiating operation of said telephone.
2. The apparatus of claim 1 wherein the distal region of said sliding member includes a microphone and is curved upward from said body such that said distal region is closer to the mouth of an individual using said telephone.
3. The apparatus of claim 2 wherein said resistance element is said microphone.

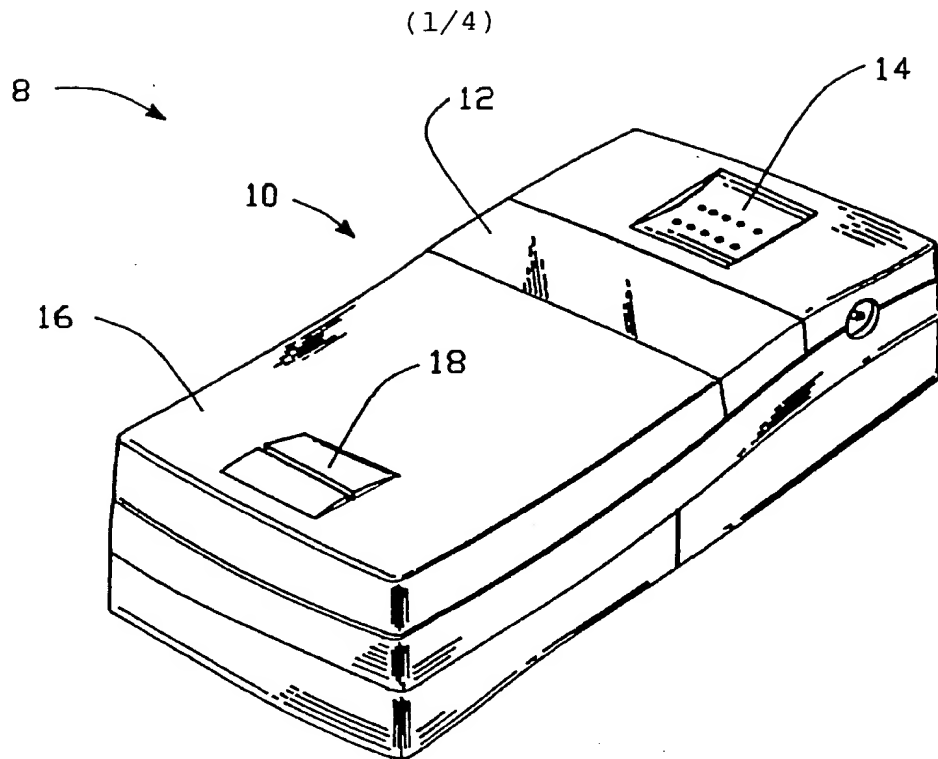


FIG.—1

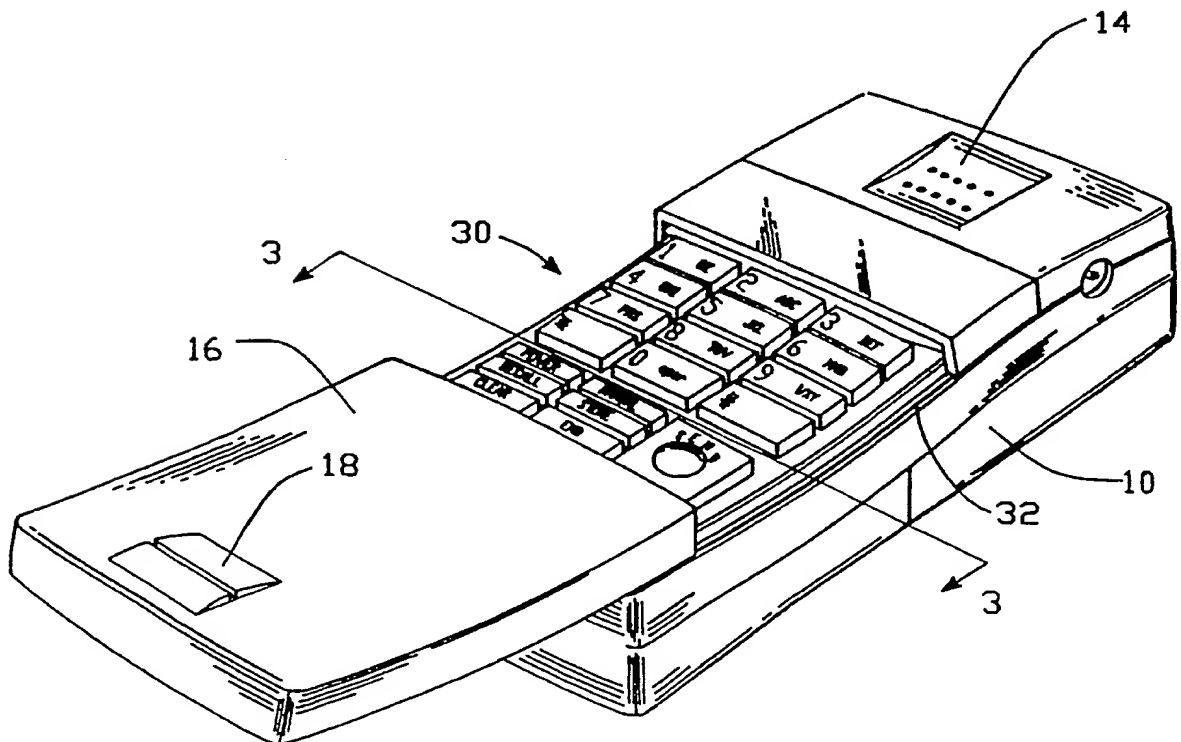


FIG.—2

SUBSTITUTE SHEET

(2/4)

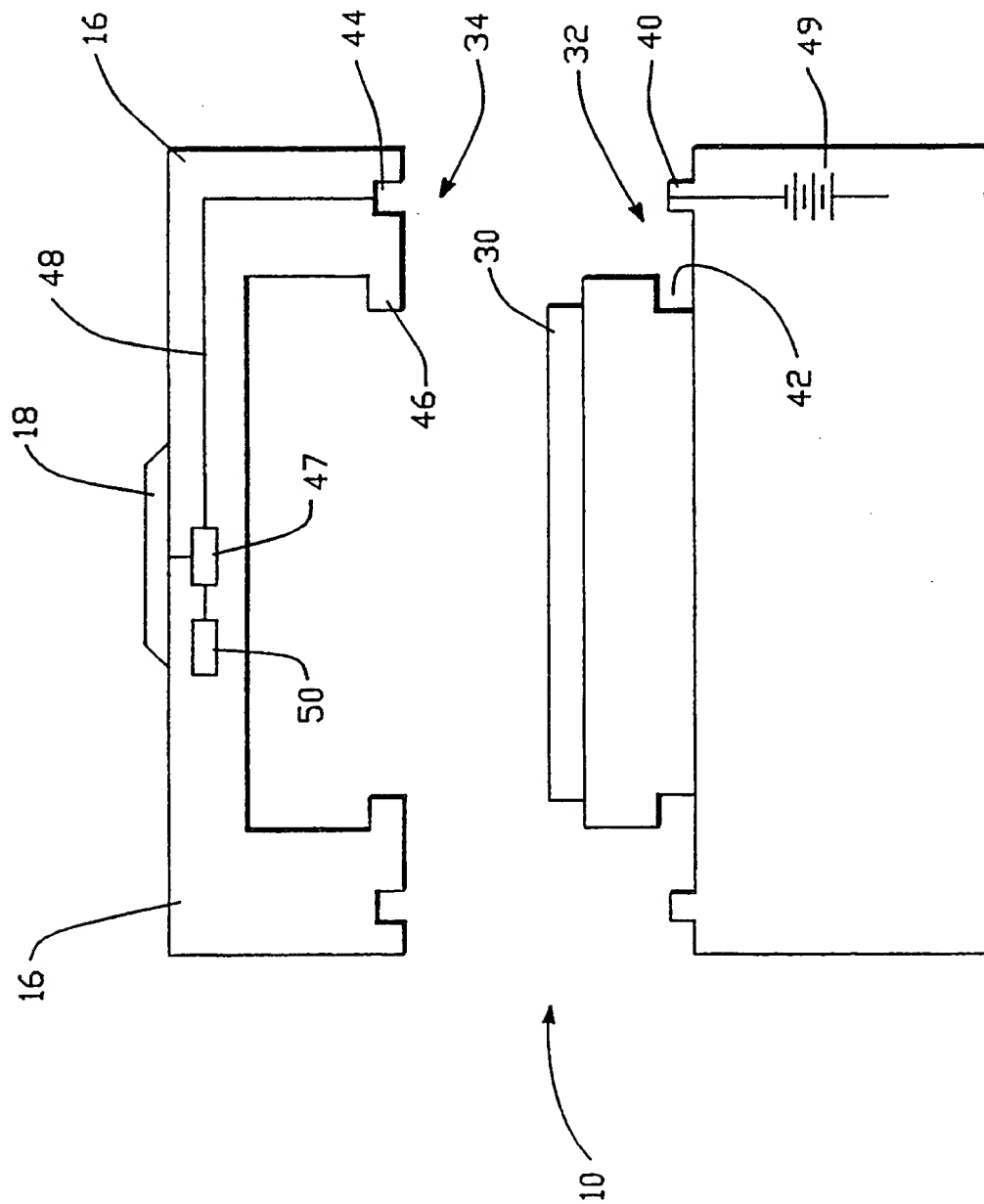


FIG.-3



(3/4)

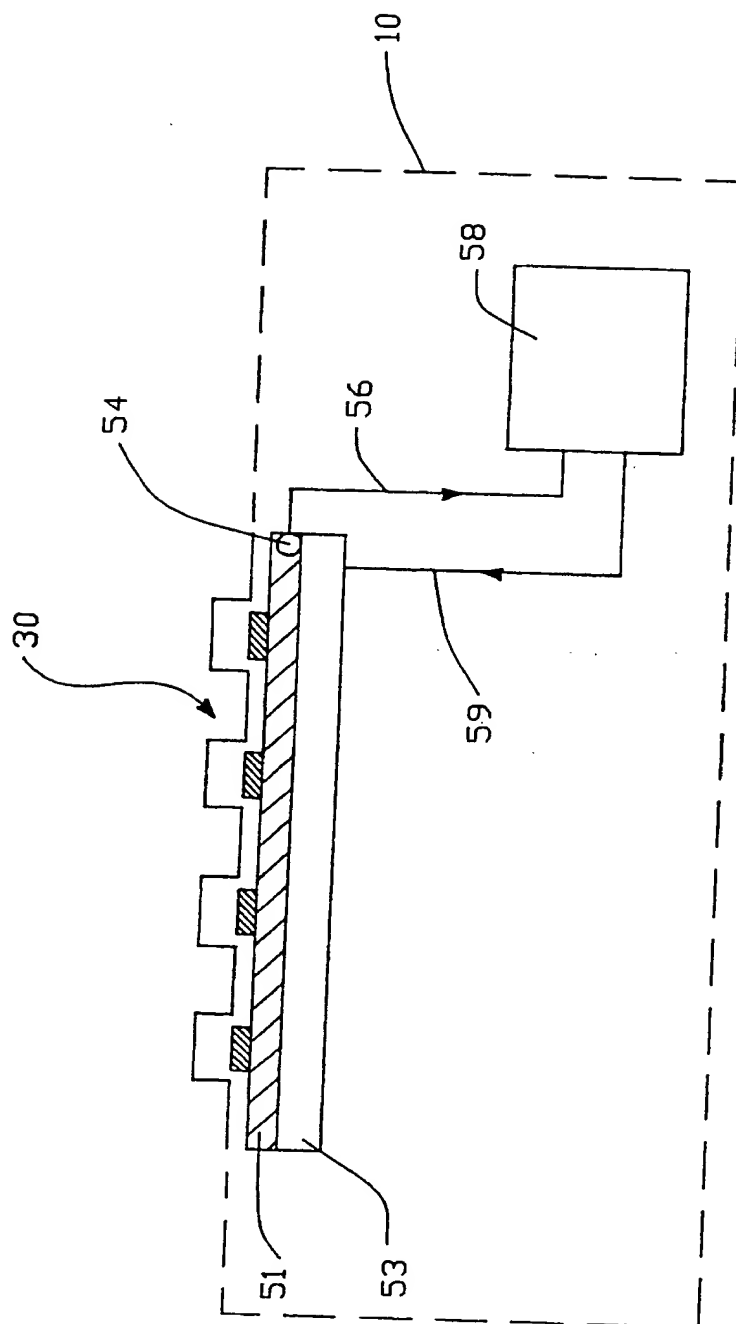


FIG.-4

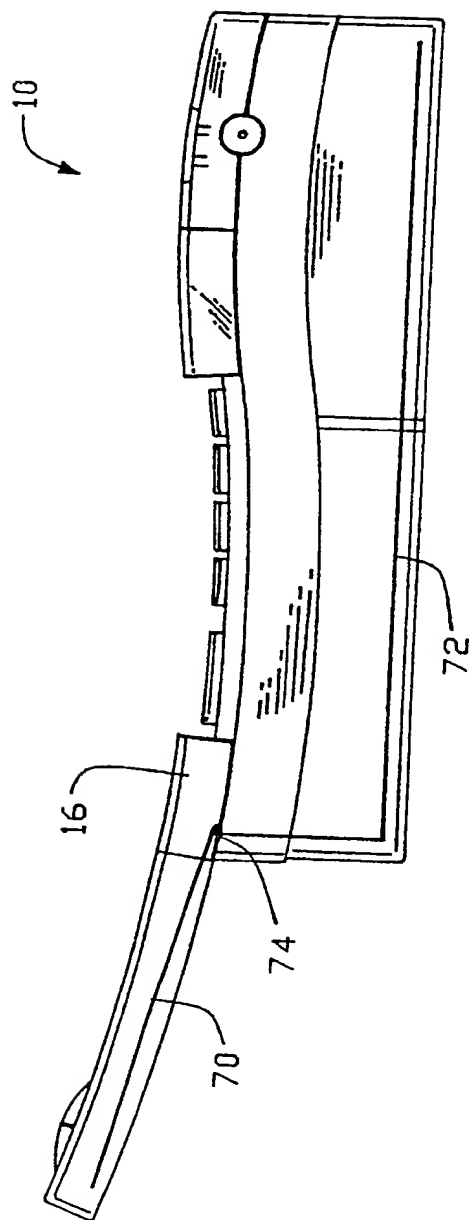


FIG. -5

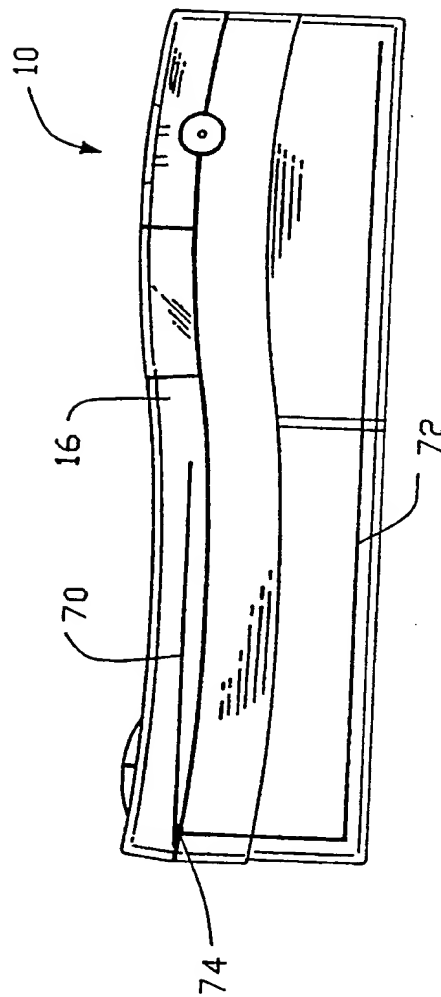


FIG. -6

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US91/08518

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>8</sup> According to International Patent Classification (IPC) or to both National Classification and IPC IPC(5): H04M 1/00                      U.S. CL: 379/428																										
<b>II. FIELDS SEARCHED</b> <div style="text-align: right; font-size: small;">Minimum Documentation Searched <sup>7</sup></div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; text-align: left; padding: 5px;">Classification System</th> <th style="text-align: left; padding: 5px;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">U. S.</td> <td style="padding: 5px;">379/56, 58, 61, 419, 428, 433, 434, 440, 448</td> </tr> </table> <div style="text-align: center; font-size: x-small; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup></div>			Classification System	Classification Symbols	U. S.	379/56, 58, 61, 419, 428, 433, 434, 440, 448																				
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U. S.	379/56, 58, 61, 419, 428, 433, 434, 440, 448																									
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; text-align: left; padding: 5px;">Category <sup>9</sup></th> <th style="text-align: left; padding: 5px;">Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup></th> <th style="width: 15%; text-align: left; padding: 5px;">Relevant to Claim No. <sup>13</sup></th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">DE, A, 3,323,858 (BRANDENSTEIN) 03 JANUARY 1985 See Figures 11 and 12.</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, A, 3,828,173 (NIEDERHOFER) 22 FEBRUARY 1990</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">EP, A, 0,389,676 (INUBUSHI ET. AL.) 03 OCTOBER 1990</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 3,551,607 (TOMMASI) 29 DECEMBER 1970</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 4,018,998 (WEGNER) 19 APRIL 1977</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">Y</td> <td style="padding: 5px;">US, A, 4,272,655 (MACKENZIE ET. AL.) 09 JUNE 1981 See Figure 2, #C and column 4, line 61 to Column 5, line 22).</td> <td style="text-align: center; vertical-align: top; padding: 5px;">2,6</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 4,517,419 (KOSTEN) 14 MAY 1985</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1-6</td> </tr> </table>			Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>	Y	DE, A, 3,323,858 (BRANDENSTEIN) 03 JANUARY 1985 See Figures 11 and 12.	1-6	A	DE, A, 3,828,173 (NIEDERHOFER) 22 FEBRUARY 1990	1-6	A	EP, A, 0,389,676 (INUBUSHI ET. AL.) 03 OCTOBER 1990	1-6	A	US, A, 3,551,607 (TOMMASI) 29 DECEMBER 1970	1-6	A	US, A, 4,018,998 (WEGNER) 19 APRIL 1977	1-6	Y	US, A, 4,272,655 (MACKENZIE ET. AL.) 09 JUNE 1981 See Figure 2, #C and column 4, line 61 to Column 5, line 22).	2,6	A	US, A, 4,517,419 (KOSTEN) 14 MAY 1985	1-6
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<div style="display: flex; justify-content: space-between; font-size: x-small;"> <div style="width: 45%;"> <p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Δ" document member of the same patent family</p> </div> </div>																										
<b>IV. CERTIFICATION</b> <table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;">           Date of the Actual Completion of the International Search  <b>10 MARCH 1992</b> </td> <td style="width: 50%; vertical-align: top;">           Date of Mailing of this International Search Report  <b>25 MAR 1992</b> </td> </tr> <tr> <td style="vertical-align: top;">           International Searching Authority  <b>ISA/US</b> </td> <td style="vertical-align: top;">           Signature of Authorized Officer    <b>WILLIAM CUMMING</b> </td> </tr> </table>			Date of the Actual Completion of the International Search <b>10 MARCH 1992</b>	Date of Mailing of this International Search Report <b>25 MAR 1992</b>	International Searching Authority <b>ISA/US</b>	Signature of Authorized Officer  <b>WILLIAM CUMMING</b>																				
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## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE<sup>1</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers \_\_\_\_\_, because they relate to subject matter <sup>12</sup> not required to be searched by this Authority, namely:
  
2. ☐ Claim numbers \_\_\_\_\_, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:
  
3. ☐ Claim numbers \_\_\_\_\_, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☒ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING<sup>2</sup>

This international Searching Authority found multiple inventions in this international application as follows:

See Form 206

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers: 1 - 6
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remarks on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.